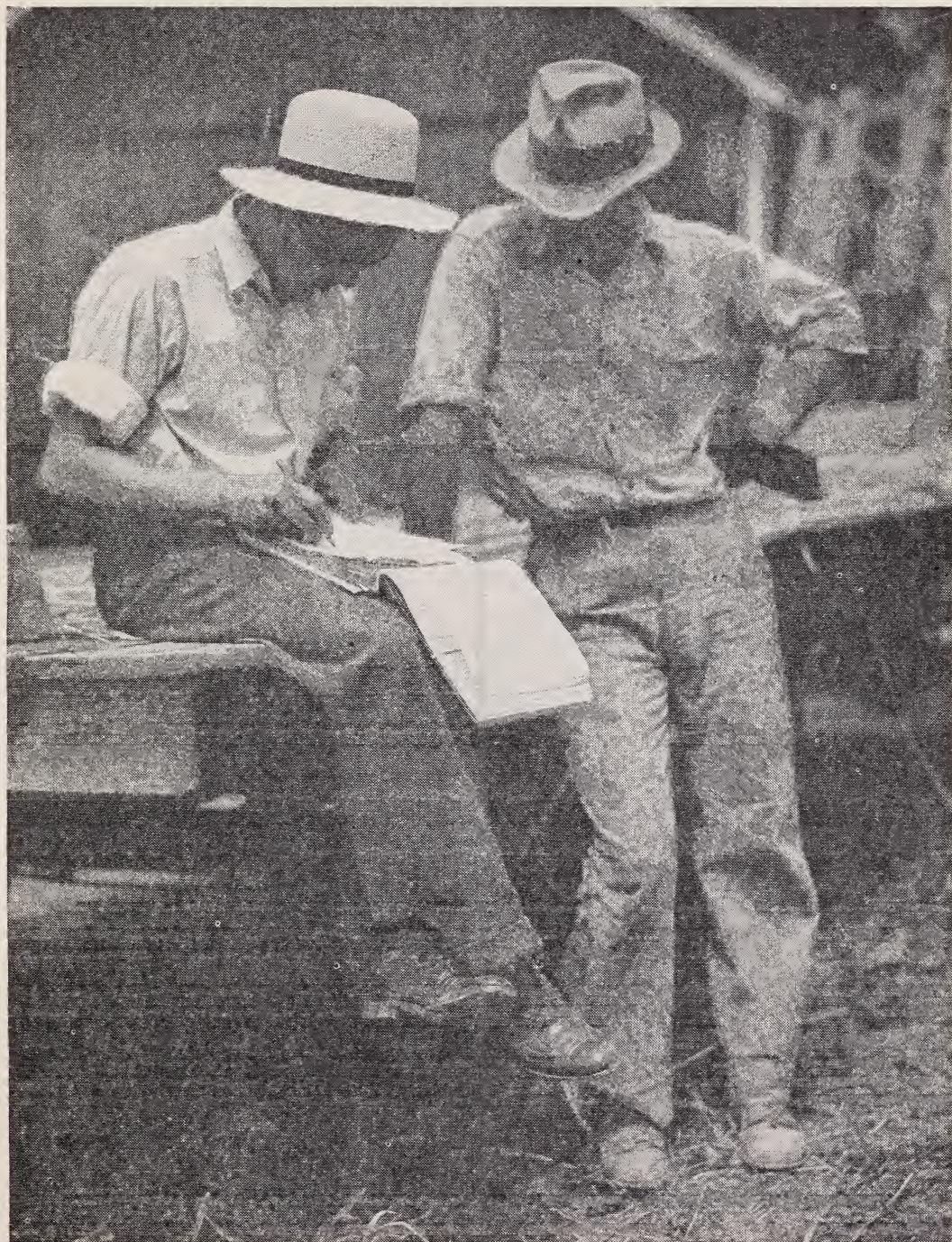


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The Dairy-Herd-Improvement Association Program



Farmers' Bulletin No. 1974

U . S . D E P A R T M E N T O F A G R I C U L T U R E

MORE THAN 40 YEARS AGO a few progressive dairy farmers in Michigan organized the first cow-testing association in the United States. They wanted to improve the profitableness of their herds.

They hired a tester to weigh and test the milk of each cow and keep a record of her feed cost and income. They wanted that information so they could cull the low producers from their herds and feed the rest more economically.

In the first 4 years of their pioneer effort these Michigan dairy farmers doubled the average profit per cow. Since then thousands of other dairy farmers have followed their example with equally striking results.

The cow-testing movement grew and eventually expanded into the present-day dairy-herd-improvement-association program. Members of these associations now use their records not only to test the cows but to prove the bulls. The improvement they have brought about in their herds is one of the outstanding "success" stories in our agriculture.

No herd is so good that it cannot be made better by effective culling, good feeding, and the use of production-tested breeding stock. Breeding records and records of production, feed cost, and income are essential for carrying on such an improvement program. Membership in a dairy-herd-improvement association is one of the best and most economical ways for any dairy farmer to obtain the necessary records.

This bulletin supersedes Farmers' Bulletin No. 1604, Dairy Herd Improvement Associations and Stories the Records Tell.

THE DAIRY-HERD-IMPROVEMENT ASSOCIATION PROGRAM

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Contents

	Page		Page
How a typical association operates.....	2	How to organize and operate an as-	
Origin and development of the as-		sociation	15
sociation program.....	2	Cost of operation.....	16
Growth in association member-		The testing outfit.....	17
ship.....	3	Selecting a supervisor.....	17
Increase in average production of		The supervisor's work.....	18
association cows.....	4	Working with the supervisor.....	18
High-producing cows most profit-		Activities of the association.....	19
able.....	6	County-wide associations.....	19
Why records are essential for herd		Owner-sampler testing.....	20
improvement.....	6	Constitution and bylaws for the co-	
Culling the unprofitable cows....	7	operative dairy-herd-improve-	
Feeding for profitable production....	8	ment association.....	21
Breeding for better cows.....	10	Constitution	21
Association records are basis of		Bylaws.....	22
Nation-wide breeding program....	12	Form for membership agree-	
Identification and production rec-		ment	22
ords.....	12	Form for supervisor's agreement	
Proved-sire records.....	14	with the association.....	23
Herd-analysis tabulations.....	14	Additional information.....	24

AMERICAN DAIRY FARMERS have some of the best milk-producing cows in the world, but they also have some of the poorest. Of the 24 million cows that are kept for milking purposes throughout the United States, it is estimated that approximately one-third do not produce enough milk or butterfat in a year to return a profit on the feed and labor they require. Any herd—large or small, good or poor—would be more profitable if the lowest producers were culled from the herd and better cows were put in their place.

A herd of uniformly good cows cannot be developed easily or quickly, but the average production level of any herd can be improved gradually by effective culling, proper feeding, and careful selection of breeding stock; the producing efficiency of the best herds can be maintained by following the same practices. Fortunately, no exorbitant financial investment is necessary—only careful planning and management and a persistent determination to develop a good herd.

In order to cull, feed, and breed intelligently, however, any dairyman must have records of the production and feed consumption of

every cow in his herd, year after year. There is no substitute for the actual records. Guesses and estimates may serve for a time, but worth-while improvement is seldom obtained without records.

One of the most practical and economical ways for any dairyman to obtain the necessary records continuously over a period of years is through membership in a dairy-herd-improvement association.

HOW A TYPICAL ASSOCIATION OPERATES

A typical dairy-herd-improvement association is a cooperative organization of dairy farmers, usually about 26, who employ a tester or supervisor to keep feed, production, income, and breeding records on their cows.

The supervisor visits each herd in the association once a month, usually arriving at the farm in the late afternoon. During the evening milking he weighs the feed consumed and the milk produced by each cow and also saves a small sample of her milk. He follows the same procedure during the milking the next morning, and then tests the milk samples to determine the percentage of butterfat. Using the weights and tests for the 24-hour period, he calculates each cow's milk and butterfat production for the month. At the end of the year he compiles the yearly record for each cow and each herd. Numerous studies have shown that yearly records based on weights and tests for 1 day each month are satisfactory for all practical purposes, being within 2 percent of the actual milk production and 3 percent of the butterfat production.

The supervisor enters all records in a herd-record book, which the herd owner keeps and uses as a guide in his management operations. The supervisor also assists the owner in keeping a complete record of the progeny of each cow, and he eartags those animals in the herd that are not otherwise identified. He aids the dairyman in every possible way to improve his herd; and frequently the supervisor is able to suggest suitable changes in feeding or management of the herd or individual cows when the records indicate the need for a change.

ORIGIN AND DEVELOPMENT OF THE ASSOCIATION PROGRAM

Like many other worth-while developments in the dairy industry, the idea of a group of farmers organizing a cooperative association for "testing cows" and keeping records originated in Denmark, where the first cow-testing association was started in 1895.

In the fall of 1905 Helmer Rabild, who was born in Denmark, organized the first such association in the United States, in Newaygo County, Mich. He was an inspector in the Michigan Dairy and Food Department at the time, but his leadership in organizing this first cow-testing association brought him to the attention of the Dairy Division in the United States Department of Agriculture, which he joined in 1908. He did much in the following years to stimulate interest in testing and to promote better dairying throughout the country.

Gradually the record-keeping idea gained momentum and more and more leading dairy States began to organize testing associations. At first they were started under the direction or sponsorship of the

State departments of agriculture or the State agricultural colleges. But by the time the Cooperative Agricultural Extension Act was passed in 1914, the associations had become such a promising source of practical information for other dairymen as well as for the members themselves that the associations naturally were drawn into the State and Federal extension programs.

With the help of the extension workers, the Federal Dairy Division (which became the Bureau of Dairy Industry in 1924) continued to promote the organization of cow-testing associations, held meetings on members' farms to discuss approved dairy methods, and often arranged tours of inspection to show other farmers what could be accomplished by keeping records, grading up the herd with good bulls, growing alfalfa and other legume crops, improving pastures, using silos, and in general doing what the progressive association members were doing.

In the early 1920's the American Dairy Science Association also began to take an interest in the educational possibilities of the record-keeping program; and in 1926, because the cow-testing associations had come to have a much broader influence, the Dairy Science Association passed a resolution to change the name to dairy-herd-improvement associations. At the same time more uniform testing and record-keeping procedures were introduced among the States. This was a great advantage when the Bureau of Dairy Industry and the State extension services began in 1935 to use the association records in a Nation-wide sire-proving program.

Today the many dairy-herd-improvement associations scattered throughout the various States operate on a uniform basis and serve not only for the benefit of the individual members but also for the improvement of the Nation's dairy cattle. The work in each State is under the general direction and supervision of the State extension dairyman of the State agricultural college and under the immediate direction of the county agricultural agents. The Bureau of Dairy Industry furnishes the record-keeping forms used in collecting the information and cooperates with the States to coordinate the program on a uniform basis throughout the entire country.

The testing work, including the calculating, compiling, and reporting of all the data, is done according to rules established by the American Dairy Science Association, in order to insure reliable and comparable records. The principal points of the rules are: In each herd all weighing, sampling, and testing of milk must be done by the supervisor; all cows of milking age in the herd must be put on test; all cows that have been on test in the herd during the year must be included in the yearly herd average; and the supervisor must use the figures he himself obtained on the testing day, as a basis for computing the monthly production.

GROWTH IN ASSOCIATION MEMBERSHIP

Interest and participation by dairy farmers in dairy-herd-improvement associations has increased rather steadily since 1906, except during those periods when economic conditions were unfavorable throughout the country and during war periods when the shortage

of manpower and the difficulty of keeping trained supervisors made it necessary for many associations to discontinue testing. The program reached its greatest growth in 1948, when 33,274 dairymen in 1,668 associations had a total of 886,129 cows on test. (See table 1.) Figure 1 shows the location of dairy-herd-improvement associations in the various States.

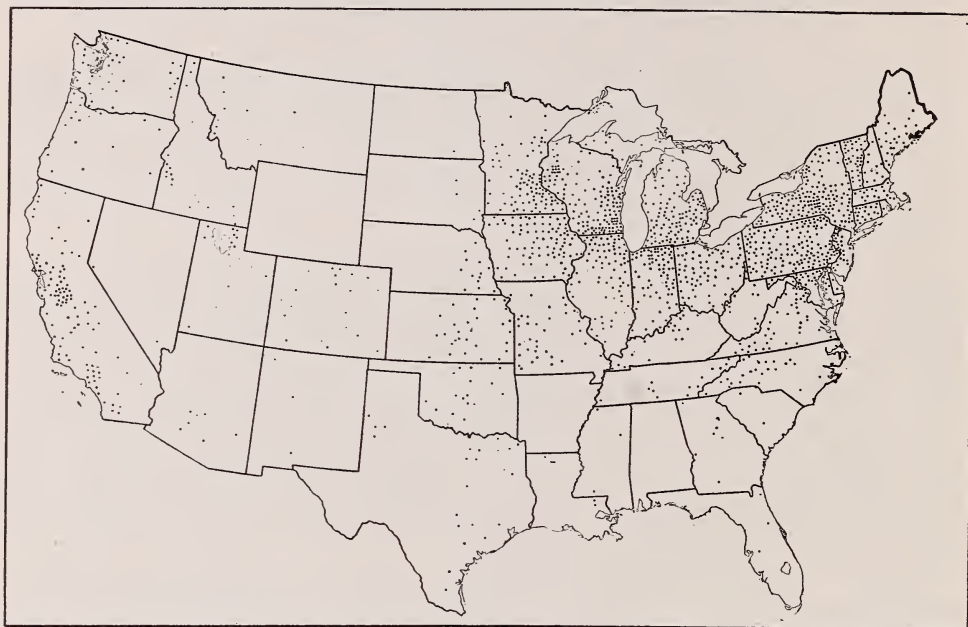


FIGURE 1.—Location of the 1,668 dairy-herd-improvement associations that were active in 1948.

INCREASE IN AVERAGE PRODUCTION OF ASSOCIATION COWS

The general progress toward higher levels of production in the association herds is one of the outstanding success stories in agriculture. The average of the 239 cows tested the first year in the first association was 215 pounds of butterfat per cow, and the average of the 775,546 association cows tested in 1947 was 348 pounds. During the same period the average production of all cows milked in the United States increased from 146 pounds to 199. (See table 1.)

The relatively high average production in the association herds is an indication of the improvement that can be made by dairymen who use feed and production records as a guide in culling the low-producing cows from their herds, in feeding the remaining cows according to their producing capacity, and in selecting breeding animals that have demonstrated an ability to transmit high production to their offspring.

Further evidence of the progressive improvement made by association members is indicated by the gradual reduction in the number of low-producing cows in the association herds and the increase in the number of higher producing cows. Table 2 shows the changes in the percentages of high- and low-producing cows from 1926 to 1947, inclusive.

TABLE 1.—*Growth of dairy-herd-improvement association work in the United States*

Year	Associations	Herds on test	Cows on test	Average yearly production					
				Association cows			All cows milked in the United States		
				Milk	Butterfat		Milk	Butterfat	
	Number	Number	Number	Pounds	Per-cent	Pounds	Pounds	Per-cent	Pounds
1906	1	31	239	5, 300	4. 1	215	3, 646	4. 0	146
1907	4	-----	1, 606	5, 366	4. 1	220	-----	-----	-----
1908	6	-----	3, 921	-----	-----	-----	-----	-----	-----
1909	25	-----	11, 686	-----	-----	-----	-----	-----	-----
1910	40	-----	¹ 25, 000	-----	-----	-----	-----	-----	-----
1911	64	-----	¹ 40, 000	-----	-----	-----	-----	-----	-----
1912	82	-----	¹ 43, 000	-----	-----	-----	-----	-----	-----
1913	100	-----	47, 150	-----	-----	-----	-----	-----	-----
1914	163	-----	73, 280	-----	-----	-----	-----	-----	-----
1915	211	-----	105, 526	-----	-----	-----	-----	-----	-----
1916	346	-----	150, 677	-----	-----	-----	-----	-----	-----
1917	459	11, 720	216, 831	-----	-----	-----	-----	-----	-----
1918	353	9, 778	172, 518	-----	-----	-----	-----	-----	-----
1919	385	10, 000	167, 313	-----	-----	-----	-----	-----	-----
1920	468	11, 948	203, 472	6, 175	4. 0	247	3, 378	4. 1	137
1921	452	11, 209	193, 928	-----	-----	-----	-----	-----	-----
1922	513	12, 508	215, 321	-----	-----	-----	-----	-----	-----
1923	627	16, 356	277, 010	-----	-----	-----	-----	-----	-----
1924 ²	-----	-----	-----	-----	-----	-----	-----	-----	-----
1925 ³	732	18, 677	307, 073	7, 189	3. 9	284	4, 218	3. 9	165
1926	777	19, 540	327, 653	7, 331	4. 0	290	4, 379	3. 9	172
1927	837	21, 128	362, 014	7, 411	4. 0	293	4, 491	3. 9	176
1928	947	23, 327	414, 891	7, 476	4. 0	296	4, 516	3. 9	177
1929	1, 090	26, 182	465, 804	7, 498	4. 0	298	4, 579	3. 9	180
1930	1, 143	27, 888	507, 549	7, 642	4. 0	303	4, 508	3. 9	177
1931	1, 112	26, 308	510, 714	7, 812	3. 9	306	4, 459	3. 9	175
1932	1, 005	20, 351	427, 044	7, 858	3. 9	310	4, 307	3. 9	169
1933	881	15, 447	358, 501	7, 849	4. 0	313	4, 180	3. 9	164
1934	793	13, 694	325, 837	8, 015	4. 0	322	4, 033	3. 9	159
1935	809	15, 573	364, 218	7, 977	4. 0	322	4, 184	3. 9	165
1936	876	17, 344	404, 412	7, 912	4. 0	319	4, 316	3. 9	170
1937	992	20, 772	496, 562	7, 923	4. 0	320	4, 366	4. 0	173
1938	1, 106	23, 701	558, 993	7, 831	4. 0	317	4, 558	3. 9	180
1939	1, 228	25, 949	625, 284	7, 977	4. 1	323	4, 589	4. 0	182
1940	1, 300	27, 948	676, 141	8, 133	4. 1	331	4, 624	4. 0	183
1941	1, 383	31, 381	763, 502	8, 225	4. 1	335	4, 742	4. 0	188
1942	1, 421	32, 957	816, 117	8, 323	4. 1	339	4, 739	4. 0	188
1943	1, 057	24, 155	616, 972	8, 325	4. 1	338	4, 604	4. 0	183
1944	954	20, 825	561, 587	8, 296	4. 1	336	4, 578	4. 0	182
1945	949	21, 254	577, 200	8, 592	4. 0	346	4, 797	4. 0	191
1946	1, 124	23, 331	627, 878	8, 635	4. 0	349	4, 891	4. 0	194
1947	1, 426	28, 812	775, 546	8, 638	4. 0	348	5, 000	4. 0	199
1948	1, 668	33, 274	886, 129	-----	-----	-----	-----	-----	-----

¹ Estimated.² Date for collecting data was changed in 1924 from July 1 to January 1.³ Production records of association cows were not compiled each year on a Nation-wide basis prior to 1925.

TABLE 2.—Average yearly butterfat production per cow in dairy-herd-improvement-association herds and the percentage of cows in the different levels of production, 1926-47

Year	Cows whose yearly butterfat production was—						Average yearly butterfat production per cow
	Under 225 pounds	225 to 274 pounds	275 to 324 pounds	325 to 374 pounds	375 to 424 pounds	Over 425 pounds	
	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Pounds</i>
1926-----	22	23	23	17	9	6	289
1927-----	21	23	24	17	9	6	293
1928-----	19	22	25	17	10	7	296
1929-----	18	22	25	18	10	7	298
1930-----	17	21	24	19	11	8	303
1931-----	17	20	24	19	11	9	306
1932-----	16	20	23	19	12	10	310
1933-----	15	19	23	20	12	11	313
1934-----	15	18	23	20	13	11	322
1935-----	15	19	23	19	13	11	322
1936-----	14	19	23	20	13	11	319
1937-----	13	18	23	21	13	12	320
1938-----	13	19	24	20	13	11	317
1939-----	11	18	23	21	14	13	323
1940-----	10	15	22	22	16	15	331
1941-----	9	15	22	22	16	16	335
1942-----	9	14	21	22	17	17	339
1943-----	9	14	21	22	17	17	338
1944-----	10	15	22	22	16	15	336
1945-----	8	14	21	22	17	18	346
1946-----	8	14	21	22	17	18	349
1947-----	9	14	20	22	17	18	348

HIGH-PRODUCING COWS MOST PROFITABLE

Every dairy farmer recognizes that cows differ greatly in productivity and, therefore, in the amount of income they return over feed cost. But few farmers who keep no records realize how rapidly the income increases as the production level rises. The records of association herds have shown not only that the higher producing cows are much more profitable than the lower producers, but that this relationship holds true year in and year out, regardless of whether the times are good or bad. Table 3 shows the difference in income over feed cost from cows with different production levels and indicates why good cows and good herds are a better safeguard against adverse economic conditions than poor cows.

WHY RECORDS ARE ESSENTIAL FOR HERD IMPROVEMENT

Any dairyman who expects to improve the inherent producing capacity of his herd or to increase the profitableness with which he can turn his crops into milk must give attention to three fundamental practices in herd management—culling, feeding, and breeding. None of these practices can be conducted intelligently, nor even with any assurance that they will lead to herd improvement or greater profit,

TABLE 3.—Average return above feed cost per cow, per year, by dairy-herd-improvement-association cows with different levels of butterfat production

Butterfat production level (pounds)	1932		1937		1942		1947	
	Total feed cost	Income over feed cost	Total feed cost	Income over feed cost	Total feed cost	Income over feed cost	Total feed cost	Income over feed cost
	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>
100-----	42	11	45	10	54	15	108	29
200-----	50	46	58	47	63	57	121	111
300-----	59	83	75	90	74	104	141	193
400-----	67	125	97	134	84	151	162	279
500-----	79	170	120	190	96	197	184	367
600-----	97	236	142	240	108	251	208	444

without records of production on every cow in the herd. Without production records the dairyman can only guess which cows to discard, how much to feed those he keeps, and which animals to use for breeding purposes.

Most dairymen would not care to admit that they are unable, without production records, to point out the best cows in their herds. Yet, time and time again, new members of dairy-herd-improvement associations have found that their judgment did not agree with the records they obtained when their cows were tested. Many dairymen have been asked to point out their best cows at the time they first joined an association, and invariably at the end of the year the records have shown that some of their "best" cows were really the poorest and that some of the "poor" cows were among the best in the herd.

Not until a dairyman begins to keep records of feed consumption and milk production on every cow in his herd is he in position to feed and manage his herd efficiently or to begin systematically to improve the breeding of his herd.

CULLING THE UNPROFITABLE COWS

Perhaps the first thing a new member of a dairy-herd-improvement association can do to improve the profitableness of his herd is to discard those cows that do not produce enough milk or butterfat to pay for their feed. The records obtained each month show each cow's production, the value of her output, the cost of her feed, and the income over feed cost. Usually, as soon as the new member has 2 or 3 months' records he will find some cows that should be culled because they yield little or no profit. Eventually the records will reveal the efficiency or inefficiency of every cow in the herd and the dairyman can take steps to replace the poorest cows with better cows as rapidly as better cows can be obtained.

One of the first questions in the new member's mind may be "How much milk or butterfat must a cow produce to be profitable?" Unfortunately, no specific figure can be given that will answer that question satisfactorily for all conditions. Conditions that affect the profita-

bleness of a cow vary in different localities and in different herds in the same locality.

But each member of a dairy-herd-improvement association can answer that question for himself by studying his records. Many investigators have studied the relative influence of various factors involved in the profitableness of milk production. In general they have found that a cow must produce enough so that the market value of her milk or butterfat is equal to at least twice the cost of her feed. In other words, a cow should return at least \$2 for each dollar's worth of feed she consumes in order to pay the market price for her feed and a going rate for the labor expended on her and a proportionate share of the overhead, interest on investment, depreciation, etc. A cow that returns less than \$2 for each dollar's worth of feed consumed may not actually lose money for her owner, but she should be replaced by a higher producing cow as soon as possible.

In some areas where production costs are moderate or low or where the market price for milk or butterfat is very favorable, a cow producing only 200 pounds of butterfat per year may net a small profit. In other areas where the cost and price situation is the reverse, a cow producing as much as 300 to 350 pounds may not be profitable. With feed and production records available, any association member can determine the level of production below which he must cull to avoid financial loss and to obtain the greatest returns for capital and labor invested.

Many association members arbitrarily set a production level which their cows must equal or exceed to remain in the herd. Some association members will not keep a cow that does not produce more than 300 pounds of butterfat per year. Others establish a culling deadline as high as 350 to 400 pounds. Even though a cow returns a profit, a progressive dairyman will remove her from the herd any time he can replace her with a more profitable cow.

Culling the unprofitable cows from the herd enables the dairyman to avoid further loss from those particular cows, but it does not recover the losses that have already been incurred. Because of the cost of raising and keeping a heifer until she comes into milk, she usually does not begin to return a net profit until the end of her second or her third lactation. If a heifer proves to be a poor producer and must be culled from the herd during her first or second lactation she never pays in full the cost of raising and bringing her into the milking herd. The only solution to this problem is to improve the breeding of the herd so that fewer heifers born in the herd will turn out to be low producers.

FEEDING FOR PROFITABLE PRODUCTION

No herd will produce milk and butterfat with maximum efficiency unless every cow is handled and fed properly. Many cows are low producers or unprofitable simply because they are not given as much feed as they would be able to convert into milk. But a cow may also be unprofitable if she is given more feed than she can use for milk production. With production records to guide him (fig. 2), the dairyman can easily determine how much feed each cow should have in order to make the greatest profit.

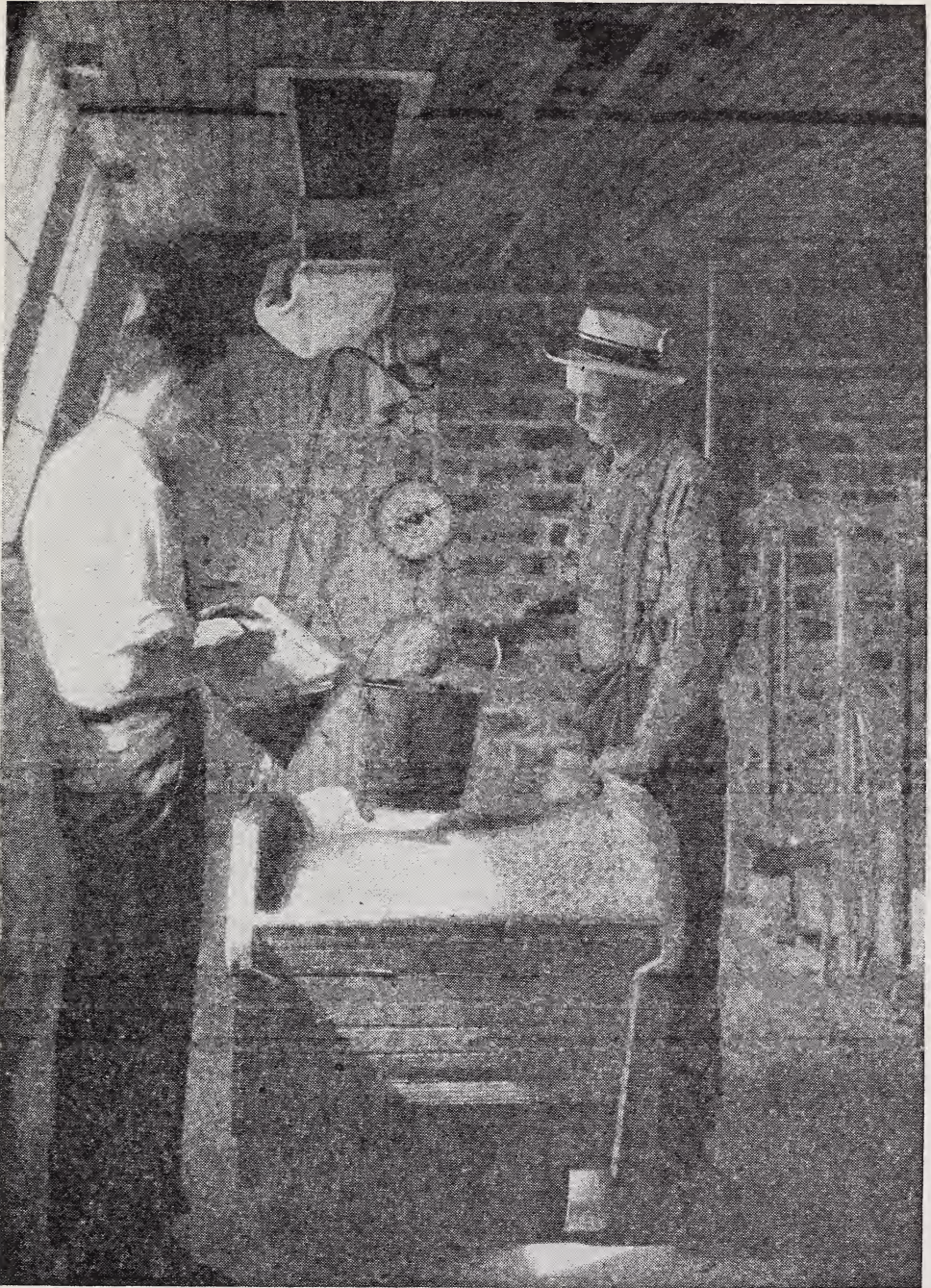


FIGURE 2.—Production records help the dairyman determine how much grain to feed each cow.

As soon as he has the first month's production records on his cows, the new association member can adjust his feeding schedule so as to supply each cow with the amount of feed she needs to keep up her milk flow. When he has more complete records on which to base his calculations he can feed each cow at her most profitable level.

Generally, if a cow is given all the feed she can convert into milk and butterfat, she will produce at her maximum efficiency or profit-

ableness. In practice, however, many factors influence the efficiency of milk production. If, for example, grain is high in price and milk is relatively low in price, it may be more profitable to feed less grain and to depend more on roughage even though less milk is obtained. On the other hand, if the price of milk is high and the price of feed is favorable or relatively low, dairymen usually find it profitable to feed grain at a heavier rate. Whatever the ratio between the price of feed and the price of milk, feed and production records will show the level of feeding to follow to obtain the most profitable return from each cow in the herd.

Association members are always in position to determine the requirements of their cows for maximum production and also to plan their feeding operations according to relative market values of feed and price of milk and thus obtain maximum returns.

BREEDING FOR BETTER COWS

Regardless of how well a herd is fed and cared for it cannot produce more than its inheritance enables it to produce. If, for example, the inherent producing capacity of the herd is limited to an average of 350 pounds of butterfat per cow per year, no amount of extra feeding or better management will increase production. Thus, after a dairyman has culled his herd carefully and is feeding the remaining cows properly, he is ready for the next and most important step in dairy-herd improvement—breeding to improve the inherent producing capacity of his herd.

To the practical dairyman the importance of a successful breeding program need not be pointed out, although it can hardly be over-emphasized. Production records are essential for the selection of breeding stock and for measuring progress in breeding better cattle. Members of dairy-herd-improvement associations soon discover from their herd records that they must select their breeding stock more carefully, particularly the herd sires, if they are to avoid raising a large percentage of heifer calves that turn out to be unprofitable cows.

The quickest and surest way to improve the inherent producing capacity of a herd is through the use of a series of good herd sires. It is often said, "The bull is half the herd." Actually, however, a succession of herd sires becomes practically the whole herd in time. This is illustrated in figure 3. The daughters of a bull each receive half their inheritance from the bull and half from their respective dams.

Thus, in one generation, the herd sire contributes 50 percent to the genetic make-up of the new heifers in the herd. Seventy-five percent of the genetic make-up of the second generation is contributed by the two bulls used in succession. In only a few years the inheritance of the herd can be almost completely reconstructed. On the average about 20 percent of the cows in a herd are removed each year, for one reason or another, and replaced by first-calf heifers. Thus, about every 5 years the average herd is an entirely new group of animals. Unfortunately, most dairymen continue year after year to raise heifer calves for replacement purposes that usually are no better and often are worse than the cows they replace. If the herd sires are carefully selected the dairyman will not only have a new herd in a relatively few years, but he will have a greatly improved herd.

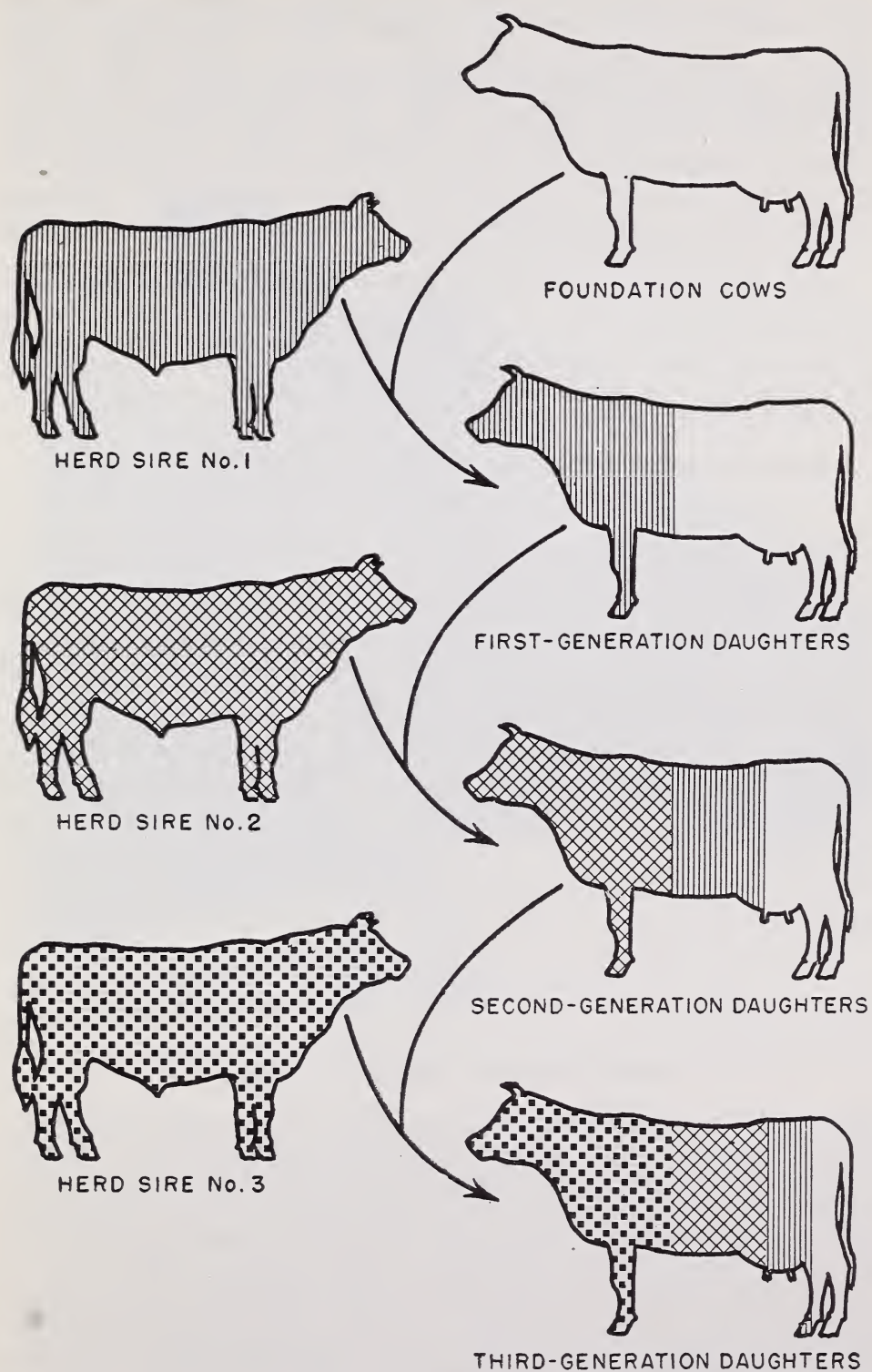


FIGURE 3.—How the influence of a succession of herd sires increases with each generation of daughters.

Dairymen generally have had discouraging experiences in their efforts to breed better producing herds. On an average, for every sire that improved the herd they have used two others that either failed to improve the herd or actually tore down practically all the improvement made by the good sire. As a result, many dairymen have come to the belief that only the skilled animal husbandman can become a successful breeder of improved dairy cattle. Actually, however, the successful breeder is not endowed with special skill. All any breeder needs is sound judgment and plenty of production records on which to base his selections and matings.

While a few of the outstandingly successful breeders of the country may appear to blend the inheritance represented in their herds in some mysterious manner, much as an artist blends his paints, most of these dairymen are following the simple formula of mating the best to the best—using production records to guide them in determining which animals are best.

ASSOCIATION RECORDS ARE BASIS OF NATION-WIDE BREEDING PROGRAM

The primary purpose of any dairy-herd-improvement association, of course, is to provide each member with records and other information he can use in improving the profitableness of his own herd. But taken collectively, the production records from large numbers of association herds in all the States now serve as the basis for a Nation-wide breeding program.

Since 1935 the Bureau of Dairy Industry, in cooperation with the State extension services, has been collecting thousands of production records from the association herds each year and tabulating them to “prove” large numbers of association sires. The records are also used in analyzing the breeding progress that is being made in many individual herds, with a view to finding improved strains and families from which desirable breeding stock may be selected. Thus the association herds may be looked upon as a mammoth breeding herd of national importance—one that is being improved constantly and one from which breeding stock is gradually disseminated to improve the thousands of other herds that make up the Nation’s dairy cattle population.

IDENTIFICATION AND PRODUCTION RECORDS

A sire is proved by comparing the production records of his unselected daughters with the records of their respective dams. Large numbers of association sires can be proved only when the production records of a large number of dams and daughters are available for tabulation and when the identity and family relationships of all the animals involved are known and can be made a matter of record.

Registered animals, of course, can be identified by their registration numbers. Other association animals, including nonregistered purebred animals and grade animals, are eartagged (fig. 4) by the association supervisor to establish their identity.

Identification records for both registered and grade animals are recorded by the association supervisor in the herd owner’s herd-record book so that the owner will have a permanent record of the correct

identification of each animal in his herd. Production records for the first 305 days of each lactation for each cow are also recorded in the herd-record book.

These identification and production records are reported by the association supervisors to their respective State agricultural colleges, from which they are sent to the Bureau of Dairy Industry to be incor-

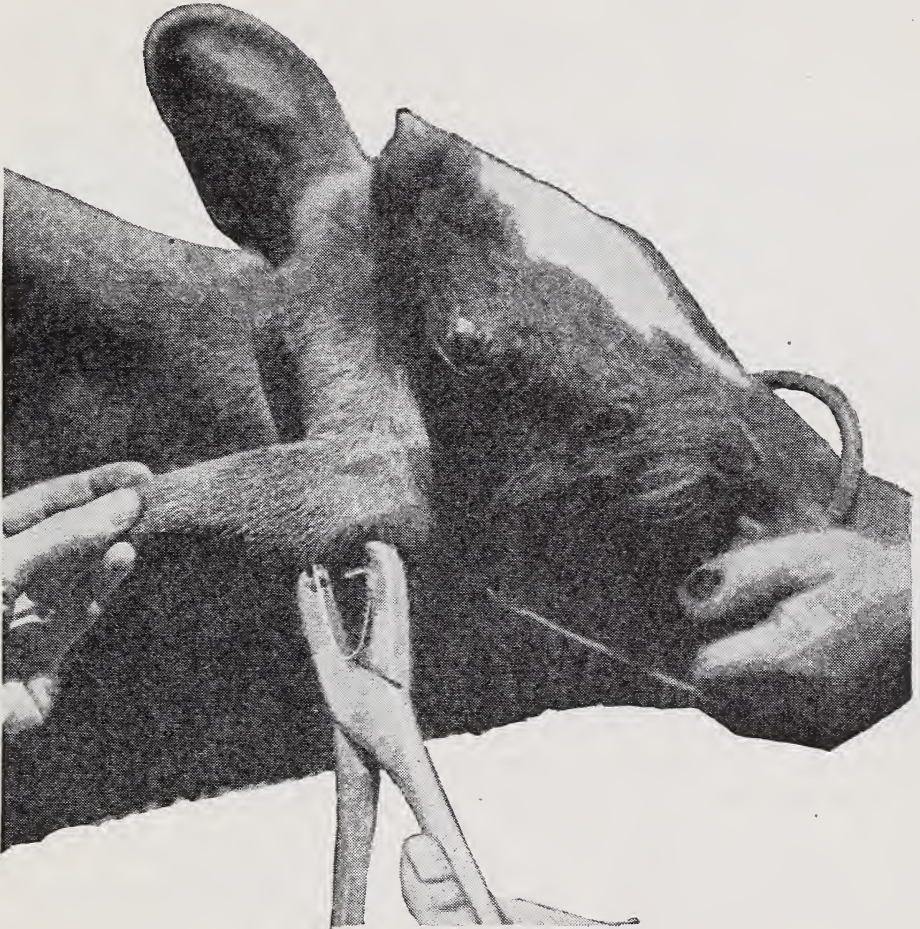


FIGURE 4.—Special dairy-herd-improvement-association eartags are used to identify all nonregistered purebred animals and grade animals in the herd.

porated in the central genealogical and production record system (fig. 5). The genealogical and production records are used in studying and analyzing the breeding worth of each sire used in association herds and of every dairy cattle family represented in the herds.

During the first 10 years the Nation-wide program of accumulating genealogical and production records in a central record system was in operation, nearly 3 million production records were reported for approximately 1 million cows. Information for analyzing breeding progress in individual herds was being accumulated on more than 40,000 association herds. Dam-and-daughter records for proving sires were being accumulated on about 100,000 sires. The program is vast in scope, and it continues to grow.

PROVED-SIRE RECORDS

A proved-sire record is a tabulation which shows the average milk and butterfat production of the unselected daughters of a sire in comparison with the average for the dams of the daughters and the amount of the average increase or decrease by the daughters. It also shows the number of daughters that excelled their respective dams in milk and butterfat production.

A proved-sire record is tabulated by the Bureau of Dairy Industry for each association sire as soon as production records for five or more dam-and-daughter pairs become available for comparison, and the sire's record is revised or retabulated from time to time as production records are accumulated for additional pairs.

The proved-sire record may show that the sire has transmitted high-, medium-, or low-producing capacity to his daughters. Therefore, to say that an association sire is a "proved sire" does not necessarily mean that he is a valuable sire; it merely means that the production records of five or more of his unselected daughters have been compared with their respective dams on a uniform basis.

Copies of the proved-sire records are sent to the State college, for transmission to the owner, the association supervisor, and the local county agent. In addition to this local distribution of information about every proved sire, a list of all proved-sire records compiled during each month throughout the year is issued and distributed monthly to all association supervisors and many county agents. At the end of the year, the information is combined in an annual printed list of proved sires, which is available to anyone interested in improving dairy cattle.

While thousands of association sires are proved every year, the supply of good proved sires available for sale or cooperative use is so limited that many dairymen will never be able to obtain the use of one. Next to a good proved sire, the sons of good proved sires are to be preferred. The sons of a good proved sire usually carry and transmit an inheritance for producing capacity similar to that of their sire, and they can be used with more assurance of success than bulls of unknown production inheritance. Proving large numbers of association sires, therefore, provides a means of locating and selecting young untried bulls for use in many average farm herds.

HERD-ANALYSIS TABULATIONS

The herd data may be compiled to show by generations the cow-family lines that are represented. These compilations, or herd-analysis tabulations, indicate the producing efficiency and breeding worth of each cow and cow family in the herd.

Such information is extremely useful to herd owners in planning their breeding programs. Sufficient data for compiling a complete analysis of the breeding progress in a herd have usually accumulated after a herd has been on test for several years, and a herd-analysis tabulation is sent to the herd owner as soon as sufficient data accumulate to make the analysis possible. The herd analysis in a sense provides the owner with a diagram or blueprint of the breeding program he has followed in the past and indicates which cow families should be perpetuated or discarded in order to improve the herd.

Compilations are also made to show, by breeds, the families of all association sires that have been proved. This breed compilation is diagrammed like a family tree and shows the relationship (sire side only) of the various sires in the family. All available production records are also incorporated in the diagram; thus, the diagram includes a three-generation production pedigree for every sire for which complete records have been reported.

Such diagrams of breed information are particularly useful and valuable in selecting desirable herd sires, since all the available production data about the sires of each breed are brought together

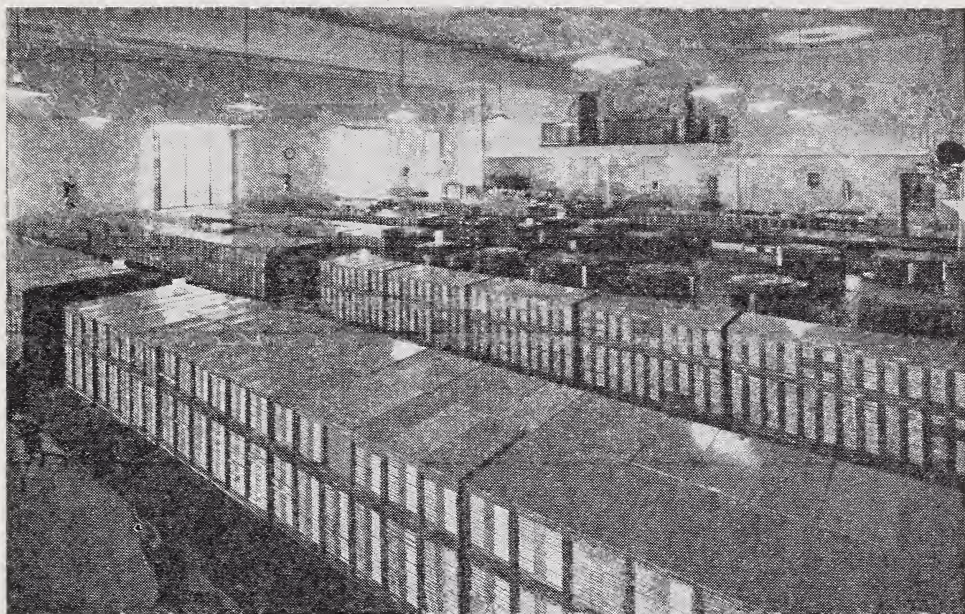


FIGURE 5.—Production and identification records of dairy-herd-improvement-association cows are recorded permanently in the central record system of the Bureau of Dairy Industry.

in one place for ready reference and study. The diagrammed information for each breed is reproduced on a microfilm which can be purchased from the Library, United States Department of Agriculture, Washington 25, D. C. The State extension dairymen and many county agents have copies of the microfilms. A dairyman in search of a herd sire should consult his county agent or write to the State extension dairyman for advice and help.

HOW TO ORGANIZE AND OPERATE AN ASSOCIATION

Dairy-herd-improvement-association work is now being conducted to some extent in every State. A dairyman wishing to place his herd on test may find it possible to join an association that is already operating in his community. Where this is not possible and in areas where there are no associations, dairymen who are interested in forming an association should confer with the local county agent. They should be willing to serve on committees to canvass the area for other interested dairymen and to aid the county agent in organizing an association. For convenience in holding meetings and also

to hold the traveling time of the supervisor to a minimum, the membership should not be scattered more than is absolutely necessary.

Usually it is better to start an organization with a full membership of 26 dairymen, which will provide a full month's work for the supervisor. Sometimes, however, fewer dairymen find it possible and practical to organize an association and employ a supervisor only part time. Frequently, in such cases, the supervisor has used his spare time to interest other dairymen in testing work and has succeeded in developing a full association membership. As soon as enough dairymen are sufficiently interested in testing their cows to insure the organization of an association, a meeting should be called to effect the permanent organization. At this meeting a board of directors should be elected and a constitution and bylaws adopted. The president and secretary-treasurer of the association are usually elected by the board of directors from its own membership.

On page 21 of this bulletin is a sample draft of a constitution and bylaws. These indicate a form of organization that will meet the needs of most associations. Whatever changes are necessary to meet local conditions can be made readily. The county agent, the State agricultural college, or the Bureau of Dairy Industry of the United States Department of Agriculture will on application furnish copies of the constitution and bylaws and membership agreements, and also copies of forms to be used in making contracts between the association and the supervisor.

While the association should operate under the direction of the State extension dairyman and with the close cooperation of the local county agent, the association officers should handle all the business affairs of the association and direct its program of herd improvement.

It is advisable for the association to be incorporated under the laws of the State which govern the incorporation of agricultural cooperative organizations. The county agent or the State extension dairyman can obtain the necessary forms and information from the secretary of the State government.

Specifically, with the advice and counsel of the State extension dairyman and the county agent, the officers and directors should conduct the business of the association, including the employment of a supervisor, the collection of testing fees, the purchase of supplies, and the enforcement of all rules. In the better associations the members pay all fees to the secretary-treasurer, who pays all bills at the direction of the board. Many associations have found it desirable, when establishing the salary of the supervisor, to provide for the payment of a substantial bonus to the supervisor at the end of the year if he has completed all his work satisfactorily and has made all required reports to the State college.

COST OF OPERATION

The principal cost in operating an association is the supervisor's salary, which is usually somewhere between \$125 and \$225 a month. In addition, there are nominal incidental expenses. The testing outfit, which must be purchased the first year, costs about \$100. An additional \$75 is usually needed to buy sulfuric acid and glassware and

to pay other miscellaneous expenses encountered in the year's work. The entire cost, including the board of the supervisor and his transportation from farm to farm, is not high for each member of the association. Generally the cost is distributed so that the owners of large herds pay more than the owners of small herds. Most States have established schedules of testing rates so that members pay in proportion to the size of their herds. (See suggested membership agreement, p. 22.)

THE TESTING OUTFIT

The necessary testing outfit consists of the following: Milk scales, Babcock tester and glassware, sample jars, sample dipper, test bottle bath, drainage rack, supply of commercial sulfuric acid (specific gravity 1.82), a set of computing tables, a suitable box with lock to hold the apparatus and to keep milk samples until they are tested. (See fig. 6.)

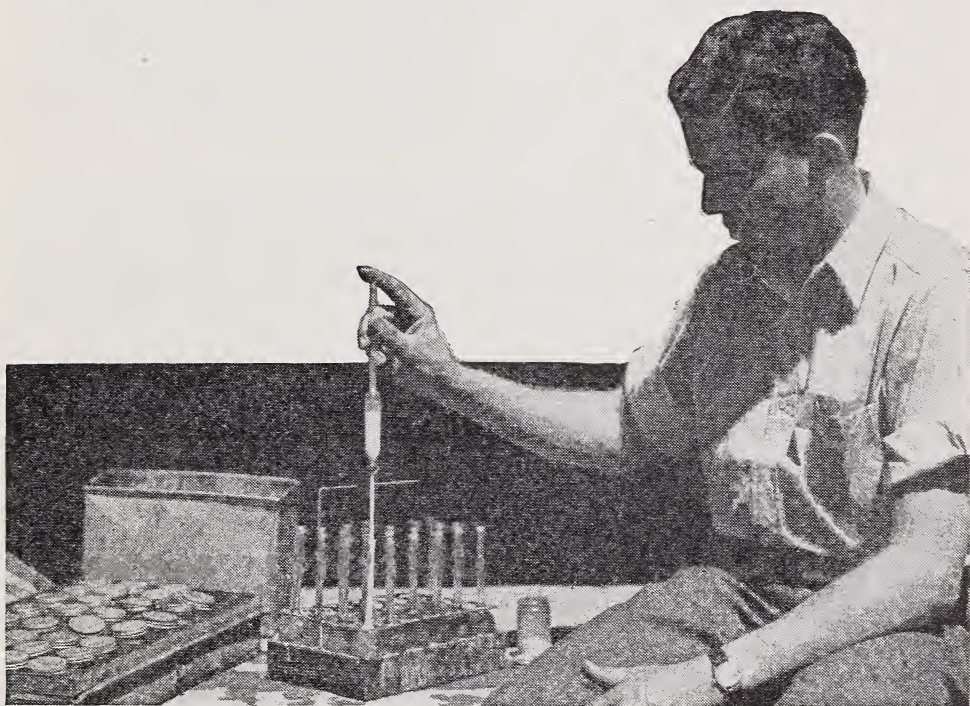


FIGURE 6.—Testing the samples of milk for percentage of butterfat.

SELECTING A SUPERVISOR

To be sure of selecting a competent supervisor, the association officer should rely on the State extension dairyman for help and guidance. A supervisor, in order to conduct all phases of the testing work satisfactorily, must have certain qualifications for the job and in addition he will need some special training under the supervision of the State college. A background of farm experience is very helpful and highly desirable. The more the supervisor actually knows about the selection, feeding, and constructive breeding of dairy cattle, the greater will be his value to the association. It is essential also that the supervisor have good habits and be neat and clean in every

way—the type of person that will be welcome in the homes of the community. Frequently, the association officers may know of some man or woman in their own community, with farm experience, who could be trained for the work of supervisor. Many women have been employed as supervisors in recent years, particularly during the war years, and in general their work has been very satisfactory.

THE SUPERVISOR'S WORK

The supervisor visits each farm one day each month. Usually he arrives in the afternoon. That evening he weighs the feed of each cow, weighs the milk, and takes a sample of the milk for testing. He records all figures in the barn book, from which he transfers them to the herd-record book. The barn book is the supervisor's record of the work, and the herd-record book remains in the possession of the farmer as his record of the work. The next morning the supervisor again weighs the feed, weighs the milk, and takes a sample of the milk for testing. He mixes the two samples of each cow's milk thoroughly and then tests the composite sample for percentage of butterfat. The day the test is made is considered as the middle day of the testing period, and the record of that day is multiplied by the number of days in the testing period.

From the herd-record book the farmer can at any time get the record of his herd and of each cow for every month from the beginning of the testing year. He can also get totals for each cow. The herd records include feed cost and production of milk and butterfat. The individual-cow records include all this and the number of pounds of each kind of feed consumed.

At the end of the testing year the farmer can get from the herd-record book the yearly summary of his herd and of each cow. As the years pass he can compare the yearly records and determine what progress his herd is making and what progress each cow is making. If the herd-record books are filled out completely and carefully, the farmer can get all this information quickly, and from this knowledge of the records of his cows he can go forward, without guesswork, in the improvement of his herd. With a well-kept herd-record book, the farmer is able to build up his herd rapidly through careful selection, planned breeding, and proper feeding.

During the year as each cow completes the first 305 days of her lactation period, the supervisor reports that production record to the State agricultural college, together with the breed of the cow, her date of birth, date of freshening, identification number, and the identification number of her sire and dam. At the end of the testing year he sends to the college a complete report of the year's work, which includes all the individual-cow records of each herd or all the herd records. These records must include feed data as well as production data for each herd on test. Records or copies of the records received from the supervisor are checked by the college and forwarded to the Bureau of Dairy Industry, United States Department of Agriculture, Washington, D. C.

WORKING WITH THE SUPERVISOR

While it is the responsibility of the supervisor to weigh and test the milk, to weigh the feed and keep complete and accurate records,

to keep the animals in the herd eartagged, to keep all reports up to date, and to give advice about feeding and caring for each cow in the herd, he cannot be expected to perform miracles for the members. He may bring the latest information from the colleges and experiment stations about herd-improvement methods, but this alone will not suffice. For the most satisfactory results he must have the fullest cooperation from every member in the association. New supervisors coming on the job will especially need assistance and encouragement until they become familiar with the details of the work.

To keep complete records the supervisor needs a great deal of information which he can obtain only with the help of the association members. This is particularly true in reporting the data and production records that are used for proving sires. Birth dates and calving dates must be kept by the member and made available to the supervisor to be included in the herd records.

Only by cooperating closely with the supervisor will the members receive the greatest dividends from testing work. The supervisor can be of great service to the community and to the members if they will work with him toward a common objective—building better dairy herds.

ACTIVITIES OF THE ASSOCIATION

If the members are to receive the fullest benefits from the association work, it is desirable to hold meetings during the year and discuss the progress of the various herds. When it is not practical to have a meeting of the full membership more than once a year, the annual meeting should be held at a time when a summary and analysis of the data obtained during the preceding year will be available for study and discussion. The membership should insist, however, that the board of directors and the officers meet as often as is necessary to handle the business affairs of the association.

Many associations have found it extremely profitable to organize tours so that members may visit the farms of the other members and observe the methods of the best dairymen. Other meetings may take the form of a summer picnic or a field day including a judging contest, demonstrations of approved dairy practices, or milking contests. Such tours or meetings are always inspirational and educational.

COUNTY-WIDE ASSOCIATIONS

The foregoing discussion has dealt with the organization and operation of the regular cooperative dairy-herd-improvement association, which usually consists of about 26 dairymen in a local community or in a relatively small area. In recent years there has developed, in the State of Washington and later in Wisconsin, Ohio, and a number of other States, a somewhat different plan of conducting cooperative testing work. This newer type of testing association—the area or county-wide association—differs from the regular association mainly in that it covers a much larger area and that milk samples are tested and the records are calculated in a central laboratory.

The testing and the record-keeping work are conducted in the same way as in the regular association, that is, in accordance with the rules of the American Dairy Science Association governing testing

work. The supervisor weighs the feed consumed and the milk produced by each cow and takes a sample of the milk of each cow, but instead of testing the milk samples on the farm he takes the samples to the central laboratory where the tests are made and the monthly production records are computed.

In some associations, the supervisor takes the member's herd book to the central laboratory and as soon as the milk samples are tested and the records are entered the book is returned to the member by mail, or the supervisor returns the book on his next trip into the area.

In other associations, the herd book remains on the farm. As soon as the milk samples are tested and the production records are computed, copies of the records are mailed to the herd owner. The supervisor enters the data in the member's herd book on his visit to the farm the next month. This procedure is recommended, as the member's herd book is always on the farm, available for reference.

The central laboratory is usually located at the county seat. It is equipped with facilities for testing large numbers of milk samples. Adding and calculating machines are provided for calculating the records. The work in the laboratory is usually done by women especially trained to perform the work. In some associations the field men or supervisors do the laboratory work. In other associations they only assist the regular laboratory workers; in some associations the supervisors do no laboratory work, spending their entire time in the field working with the association members.

The cost of setting up the central laboratory may vary from \$500 to \$1,000. Funds for establishing the central laboratory may be raised by grants, membership fees, or assessments; or the funds may be borrowed and the loan paid off gradually from the membership dues. The association is governed by a board of directors, elected from the various communities or townships of the county.

Experience indicates the following major advantages of the county-wide association over the regular association :

1. All testing and record-keeping work is done in the central laboratory, where adequate facilities can be provided, with the result that the work is done more efficiently and more accurately.

2. More dairymen can be offered the opportunity of placing their herds on test at any time, since the facilities of the testing laboratory can be extended readily.

3. The supervisor does no testing or record-keeping work on the farm and, therefore, has more time to discuss with the members various problems involved in improving dairy herds.

4. The association program is not disrupted when a dairyman drops his membership or when a supervisor is absent or resigns. The membership usually is large, and the loss of the financial support of one or even several members is not great enough to jeopardize the existence of the association. Several supervisors usually are employed by the association, and when a supervisor is absent or resigns temporary arrangements can be made for carrying on the work while the supervisor is absent or until another supervisor can be obtained.

5. The income of the association, from standard and owner-sampler members, is large enough to provide salaries which should attract and keep better trained men as association supervisors.

OWNER-SAMPLER TESTING

In order to provide as many dairymen in an area as possible with some kind of testing service and at the same time increase the gross

income of the association, most associations with central testing laboratories also conduct "owner-sampler" testing. In owner-sampler testing, the dairyman himself weighs the milk of each cow in his herd and takes a sample of the milk for testing. The association supervisor picks up the milk weight records and the milk samples when he is on a regular visit to a herd in the vicinity that is on standard test, and takes them to the central laboratory. The samples are tested in the central laboratory and records for each cow are computed, using the dairyman's own figures. The completed records are either mailed to the dairyman or are taken to him by the association supervisor on his next visit to the farm.

The use of owner-sampler records is limited to the dairyman's own herd. Because they are not obtained by a disinterested person (the association supervisor) no publicity is given to owner-sampler records. The records are not used for proving sires, and they are seldom acceptable for use in selling surplus stock. Within the dairyman's own herd, however, owner-sampler records are suitable as a guide for feeding individual cows according to production, for culling the low-producing cows, and for selecting cows whose heifer calves should be raised for herd replacements. Owner-sampler records are satisfactory for starting an improvement program in many dairy herds; but as a dairyman's plans for building his herd develop, he should place his herd on standard testing so that he will receive full benefit of the testing program.

The cost of owner-sampler testing is about one-half to two-thirds the cost of standard testing.

CONSTITUTION AND BYLAWS FOR THE COOPERATIVE DAIRY-HERD-IMPROVEMENT ASSOCIATION

(As Adopted by the Extension Section of the American Dairy Science Association)

CONSTITUTION

Article 1. Name

The name of this association shall be the _____ Dairy-Herd-Improvement Association.

Article 2. Object

The object of this association shall be to provide means and methods for improving the dairy herds of members. This will be accomplished through the keeping of production records of each cow, on the basis of which unprofitable cows may be eliminated and feeding done more economically.

Article 3. Place of Business

The principal office and place of business shall be at _____

Article 4. Membership

This association shall be composed of dairymen or owners of dairy herds who agree to comply with the members' agreement, and who are acceptable to the board of directors.

Article 5. Meetings

This association shall meet annually for the election of a board of directors and for the transaction of other necessary business at such time and place as may be determined upon by the board of directors. All members shall be notified at least one week in advance of such meetings. Special meetings of the association may be called by the president or the board of directors, notices thereof at least 2 days in advance to be given to all the members of the association. Meetings of the board of directors shall be called by the secretary on the order of the president or three members of the board.

Article 6. Organization

The governing body of this association shall consist of a board of directors composed of five active members, who shall elect from their own number a president, vice president, secretary, and treasurer, whose duties shall be those usually devolving upon such officers. The first election of officers shall be held immediately after the election of the board of directors. All officers and directors shall hold office until their successors are elected. Vacancies occurring in the board of directors shall be filled by a majority vote of the remaining members of the board.

Article 7. Business

Authority to conduct the business of the association shall be vested in the board of directors.

Article 8. Election

Election of all officers and directors shall be by a majority vote.

Article 9. Amendments

This constitution may be amended by a two-thirds vote of the active members of the association present at any annual meeting.

BYLAWS

Article 1. Order of Business

1. Reading of minutes of previous meetings.
2. Reports of secretary and treasurer.
3. Reports of committees.
4. Unfinished business.
5. New business.
6. Election of officers.

Article 2. Quorum

Three members of the board of directors shall constitute a quorum.

Article 3. Amendments

The bylaws may be amended by a two-thirds vote of the active members of the association present at any annual meeting.

FORM FOR MEMBERSHIP AGREEMENT

I agree to become a member of the _____ Dairy-Herd-Improvement Association and to maintain my membership until it is terminated either by mutual agreement with, or after one month's notice to, the association.

I further agree:

1. That the testing and record keeping shall be conducted under the rules of the American Dairy Science Association, or under any rules they may adopt in the future. (These rules provide definite standards for uniformity in dairy-herd-improvement-association work.)

2. To pay an initial membership fee of ----- before the first test is made.
3. To pay to the secretary-treasurer of the association or to his representative a monthly testing fee of ----- (It is suggested that this monthly fee be sufficient to pay the supervisor's daily wage, the member's proportional share of association operating expenses, and a bonus to be paid the supervisor when the year's work has been completed satisfactorily.)
4. To furnish board and lodging to the supervisor while at my farm.
5. To abide by the decision of the board of directors in all differences of opinion regarding the quality of the supervisor's work and the operation of the association.
6. That 30 cows, including dry cows, shall be considered a day's work for the supervisor. (In order to insure sufficient time for the supervisor to complete all records and to furnish complete D.H.I.A. service, each member according to the size of his herd, is entitled to and should pay for the following number of days' service per year from the supervisor.)

Size of herd	Days' work required per year
30 cows	12 days
35 cows	14 days
40 cows	16 days
45 cows	18 days
50 cows	20 days
55 cows	22 days
60 cows	24 days

Signed _____ Date _____
 Address _____

FORM FOR SUPERVISOR'S AGREEMENT WITH THE ASSOCIATION

This agreement, between the _____ Dairy-Herd-Improvement Association, _____ and _____
 (Address) (Supervisor)
 _____, is made with the understanding that
 (Address)

the work of the association is to be conducted as outlined in the general rules of the American Dairy Science Association governing the operation of dairy-herd-improvement associations.

The association agrees:

1. To pay the supervisor a salary of () for each day's work per month for services rendered while this agreement is in effect.
2. To pay the supervisor a bonus of () at the end of the testing year of the association for completing satisfactorily all work and reports.
3. That each association member shall furnish the supervisor with board and lodging while at his farm.
4. To furnish the supervisor with the equipment and supplies recommended by the State extension dairyman as being necessary to the efficient conduct of the work.

The supervisor agrees:

1. To perform faithfully, promptly, and efficiently the duties of association supervisor as directed by the board of directors of the association and the State extension dairyman.
2. That he will promptly make required reports of his work to the State extension dairyman.
3. To be entirely responsible for equipment and supplies furnished by the association, except for unavoidable loss, wear, or breakage.

The association and supervisor agree:

1. That the work performed by the supervisor shall be in strict accordance with the American Dairy Science Association rules governing the operation of a standard dairy-herd-improvement association and shall be done under the general direction and supervision of the State extension dairyman.
2. That the secretary of the association, the county agricultural agent, or the State extension dairyman may at any time examine the records kept by the supervisor and review the work of the supervisor, and if such examination or review discloses that the supervisor has been negligent in the performance

of duties, the association may withhold further payment of salary until the record work has been brought to a satisfactory status and the work of the supervisor is performed with acceptable proficiency.

3. That this agreement shall remain in force until it is terminated by mutual consent of both parties or by either party giving the other party a 30-day written notice.

4. The disbanding of the association shall terminate this agreement.
Signed:

----- (President of Association)	----- (Date)
----- (Supervisor)	----- (Date)

ADDITIONAL INFORMATION

For further information on dairy-herd-improvement-association testing, inquiry should be sent to the local county agent, the State extension dairyman at the State agricultural college, or the Bureau of Dairy Industry, United States Department of Agriculture, Washington 25, D. C.